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GB 1256800

GB 0884529

GB 0875446

GB 0733457

GB 0266647

US 2894718

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F2V

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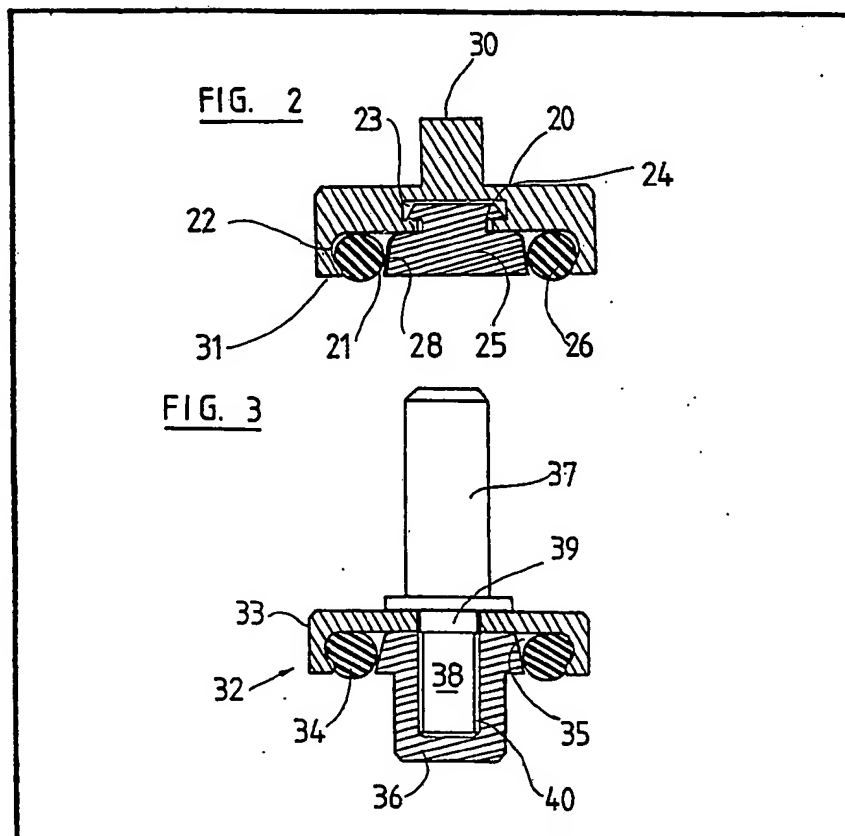
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(54) Valve seal

(57) A valve member for screw down valves or faucets, has a resilient "O" ring 26, 34, trapped in a recess by means of a central wedge, 25, 36, so that the "O" ring is squeezed between the wedge 25, 36, and the side wall 22, 33, of its containing cavity 21, 35, to thereby close off the cavity and

securely hold the "O" ring in place. Passage of liquid into the cavity is minimised by the action of the wedge, and the provision of internal securing means 24, 38, so that the wedge is held from within the cavity by a threaded stud, 38, or snap-fit projection, 24, mating with a complementary recess 23, within the wedge.



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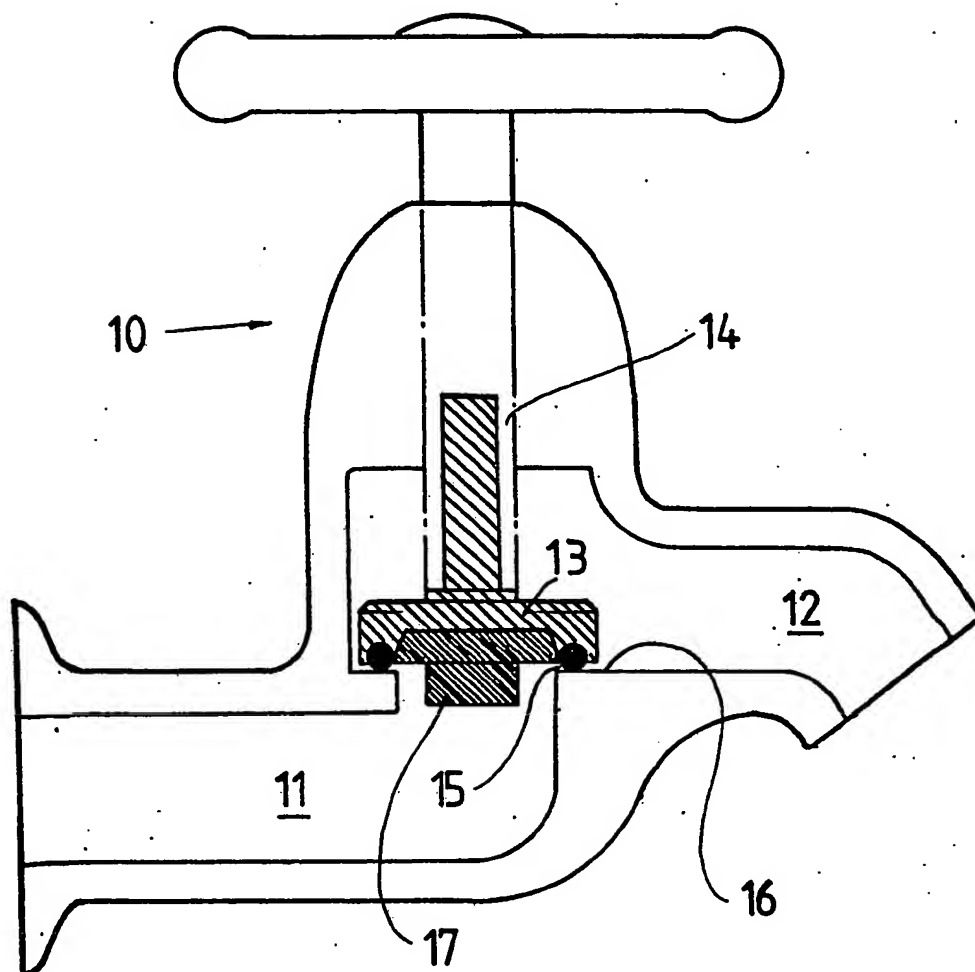


FIG. 1

FIG. 3

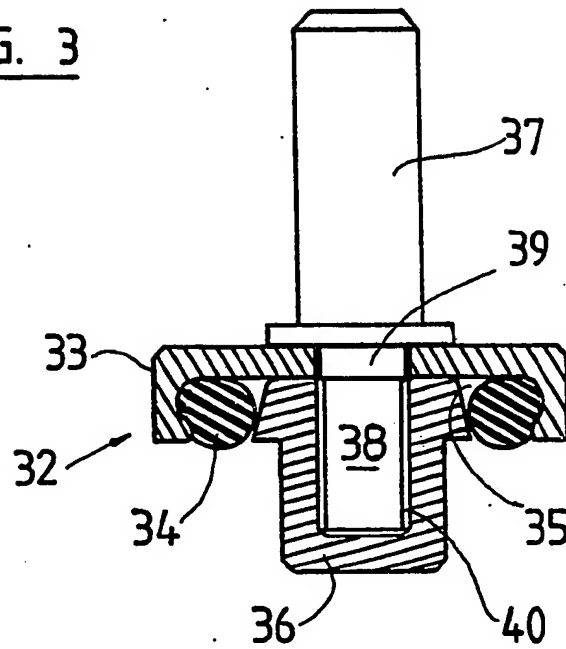


FIG. 2

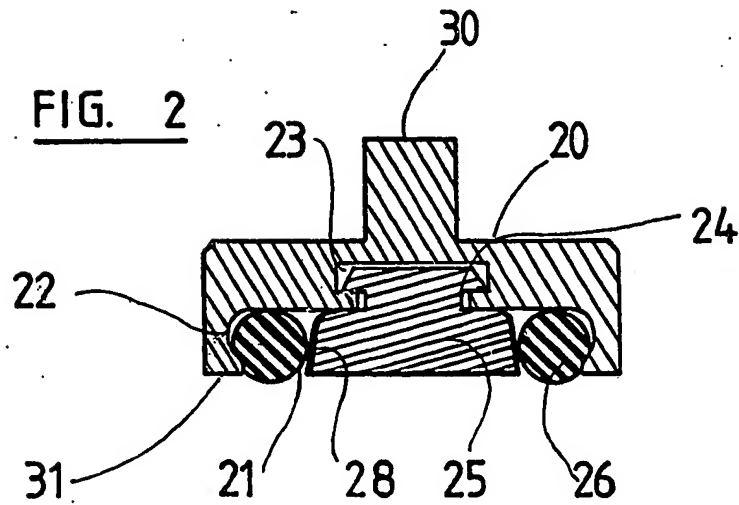


FIG. 4

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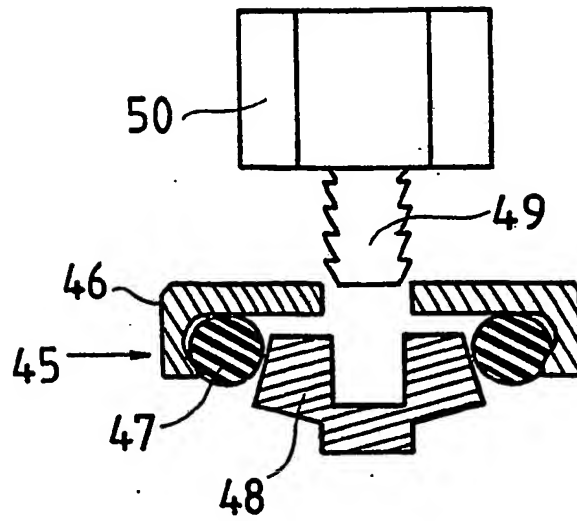
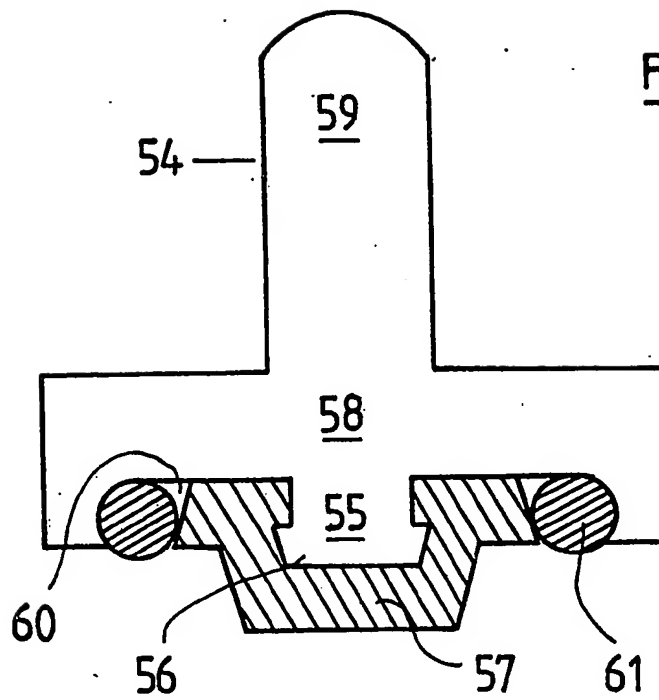


FIG. 5



## SPECIFICATION

## Valve seal

This invention relates to valves, and has particular application to valve members for use within valves such as faucets, screw down valves and the like, for liquids or gases.

Hitherto, valves for fluid control have generally utilised replaceable annular washers of a hard but somewhat resilient material, such as red fibre nylon, rubber or the like, adapted to seal against a ridged valve seat. Such washers deteriorate in use, and require higher and higher torque to effect a seal, so that the ridged seat cuts into the face of the washer. This is a problem encountered with conventional domestic faucets. It is also a problem with larger valves, as valve spanners are often used to exert high torque to close off the valve as the washer deteriorates. This often damages the valve stem threads or valve body, as well as seriously damaging the washer, and often exacerbates the problem.

In seeking to overcome this problem, many attempts have been made to mount an "O" ring in a cage, to effect a seal.

Examples of such "O" ring seals are shown in the following patents: U.S.P. 2,417,494, U.S.P. 2,658,716, U.S.P. 2,678,187, U.S.P. 2,894,718, U.S.P. 2,971,090, U.S.P. 3,198,481, U.S.P. 3,612,479, U.S.P. 3,996,965, Belgian P.N. 621,664, U.K.P. 884,529.

U.S.P. 2417494 and U.S.P. 2678187 teach the use of an "O" ring as the main sealing element clamped in the face of a valve member by means of a screw and a clamping member.

Figure 3 of the Belgian Patent teaches the use of an "O" ring clamped within a cavity by a conical headed fastener and provides a relief passage 8 between the cavity and the rear of the valve member. In the two U.S. Patents first mentioned, the "O" ring is allowed to protrude from the sealing face of the valve member. In U.K. Patent 884529, the "O" ring is held within a cavity, of such a size that the "O" ring is maintained within the cavity and does not protrude therefrom. This suffers from the disadvantage that dirt may be trapped within the cavity creating damage to the "O" ring with consequent risk of loss of seal.

## Summary of the invention

It is an object of this invention to provide an improved valve member which obviates the disadvantages of the conventional flat washer arrangement.

In one aspect, the invention provides a valve member including a body having a sealing face, a cavity in said sealing face, a toroidal resilient sealing member positioned in said cavity and having a portion protruding from said sealing face, a wedge member adapted to hold said toroidal sealing member in place, said wedge member being connected to said body by internal securing means, whereby said cavity is closed off by said toroidal sealing means being squeezed between

said body and said wedge member.

Other aspects of this invention, which should be considered in all its novel aspects, will become apparent from the following description which is given by way of example only, with reference to the accompanying drawings, in which:

Figure 1 illustrates a schematic view of a faucet, and a preferred valve member.

Figure 2 is a cross-section through a first valve member, having a snap-fit connection between a wedge member and the body of the valve member.

Figure 3 shows an alternative valve member in which the wedge member has a threaded blind aperture connected to a threaded spigot protruding through the body of the valve member.

Figure 4 illustrates a valve member suitable for connection to a valve having a non-rising spindle arrangement.

Figure 5 illustrates an alternative snap-fit connection between the wedge member and body of the valve member.

Turning now to Figure 1, a conventional faucet 10 is illustrated schematically, and contains a valve member 13 in the form of a jumper, which rests in the end of a vertically movable spindle 14 to thus close off communication between an inlet 11 and an outlet 12. The valve member 13 has a sealing face 15 adapted to seal against a flat seat 16.

Protruding from the sealing face of the valve member is a resilient toroidal sealing member in the form of a resilient "O" ring, which is trapped in the valve member. This "O" ring, is held in place by a central wedge member 17 in such a fashion that the "O" ring is squeezed between the peripheral sides of a cavity in the body, and the edge of the wedge member thereby minimising the risk of liquid entering the cavity from the sealing face. The wedge member 17 is attached to the body of the valve member by internal securing means, for example it may be glued, or welded to the internal face of the cavity within the body in the case of a plastics material, or connected thereto by an appropriate snap-fit fastener, or threaded fastener as shown in the following drawings.

Figure 2 illustrates a valve member 20 having a cavity 21 with an undercut peripheral side wall 22, and a recess 23 adapted to receive a barbed end 24 of a snap-fit wedging member 25. The body of the valve member, and the wedging member are preferably formed of a plastics material e.g. nylon or acetyl, which is sufficiently hard to form a secure cage for a resilient "O" ring 26, but yet on the other hand enables the barbed end of the wedge member to snap-fit into the recessed 23.

The wedge member 25 preferably has sloping sides 28, which slope at approximately 20° to the central axis of the rearwardly facing spill 30 of the valve member. By this means, a resilient "O" ring 26 can be held in place within a cavity 21; with the frusto-conical wedge member 25 squeezing the "O" ring against the undercut peripheral side

wall 22, so that the "O" ring is squeezed and partly protrudes from the main sealing face 31 of the valve member. By suitably shaping the peripheral side wall, it is possible to leave a relieving portion within the cavity 21 between the "O" ring and the wedge member 25.

Figure 3 shows an alternative arrangement in which a valve member 32 has a cage 33, and "O" ring 34 within a cavity 35 in the cage, and held in place by a central wedge member 36. Holding the central wedge member 36 in place is a removable spill 37, having a threaded spigot 38 extending through an aperture 39 in the rear of the cage, and into engagement with a corresponding threaded recess 40 within the wedge member 36. By this means, the spill 37 can be unscrewed from the valve member 36 to replace the "O" ring if required. In addition, if a different size of spill is required to fit a particular faucet, then the spill can be removed and replaced by a spill of a different diameter, enabling economies to be achieved in stock holding, by forming jumpers for faucets, having common cages and wedge members, but forming spills of different diameters, to enable jumpers of the required dimensions to be assembled when required. For example, different manufacturers produce 1/2" standard jumpers with either 1/4" or 3/16" diameter spills.

The valve member of Figure 3 is preferably formed of metal, such as bronze, monel or stainless steel, whilst the "O" ring can be formed of a resilient material such as rubber or viton.

Figure 4 shows a valve member 45 having a metal cage 46, a resilient "O" ring 47, and a wedge member 48 formed of a relatively hard plastics material such as nylon or acetyl, adapted to engage with a barbed spigot 49 of a non-rising spindle member 50. By providing the barbed spigot 49 of metal, it will bite into and engage with the plastics wedge 48. Thus the barbed spigot 49 is of a harder material than the wedge 48, whilst the wedge 48 is of a harder material than the resilient "O" ring 47.

The non-rising spindle member 40 can be of prismatic shape, e.g. a hexagon, and adapted to fit within a corresponding prismatic recess in a faucet body, so that rotation of a threaded spindle within the prismatic member 50 will enable the spindle to rotate without rising, but will affect upwards or downwards movement of the prismatic member 50 thereby moving the valve member towards or away from a valve seat.

Figure 5 illustrates an alternative snap-fit arrangement in which a valve member 54 has a barbed central spigot 55 adapted to inter-engage with a corresponding recess 56 within a central wedging member 57. The body 58 of the valve member is conveniently formed as a jumper having a central spill 59, integral therewith, and the body 58 may be formed of metal or plastics with an appropriate recess 60 in the sealing face thereof.

The central wedging member 57 is conveniently formed of a plastics material which

is harder than the resilient "O" ring 61, yet is resilient enough to snap over the central barb 55. A suitable material for the wedging member 57 is acetyl or nylon, or other plastics material.

Whilst the valve member of this invention can be used with a conventional ridged seat, it is preferred that it is used in combination with a flat seat. A flat seat is cheaper to produce than a ridged seat. Moreover, the protruding nature of the resilient "O" ring against a flat seat, will tend to minimise underwater shock, when used in marine valves, and will assist in minimising noise of the valve in operation. This is advantageous in naval use, where the presence of the protruding resilient "O" ring will tend to minimise valve chatter, and hence minimise valve noise from reciprocating pumping machinery. The valve members of this invention have been tested over a wide range of pressures, and it is believed that the configuration of the central wedge member and the provision of internal securing means, enables the "O" ring to be securely held in place with minimal risk of pressure build up within the cavity which would otherwise tend to cause the "O" ring to pop out of the cavity as the valve was opened.

Finally, it will be appreciated that various alterations or modifications may be made to the foregoing without departing from the scope of this invention as exemplified by the following claims.

#### Claims

1. A valve member including a body having a sealing face, a cavity in said sealing face, a toroidal resilient sealing member positioned in said cavity and having a portion protruding from said sealing face, a wedge member adapted to hold said toroidal sealing member in place, said wedge member being connected to said body by internal securing means, whereby said cavity is closed off by said toroidal sealing means being squeezed between said body and said wedge member.

2. A valve member as claimed in Claim 1, wherein said wedge member is frusto-conical and fits within said toroidal sealing member.

3. A valve member as claimed in Claim 1 or Claim 2, wherein said internal securing means includes a projection on said wedge member adapted to engage a corresponding recess or aperture within said body.

4. A valve member as claimed in Claim 1 or Claim 2, wherein said internal securing means includes a recess within said wedge member adapted to engage a corresponding projection within said body.

5. A valve member as claimed in Claim 4, wherein said projection has a screw thread adapted to mate with an internal screw thread within said recess.

6. A valve member as claimed in Claim 3 or Claim 4, wherein said projection has a rib or ribs adapted to engage said recess.

7. A valve member as claimed in any preceding

claim, having a spill protruding from the rear thereof.

8. A valve member as claimed in any preceding claim, within the toroidal sealing means is an "O" ring and said cavity has an undercut peripheral lip to assist the wedge member to hold the "O" ring in place.

9. A valve member substantially as herein described with reference to any one of the accompanying drawings.

10. A valve having a flat seat in combination with a valve member as claimed in any preceding claim.

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